

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Milking Equipment

I, EDWARD DAVID DYKE, a British Subject, of 408, Hythe Road, Ashford, Kent, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to milking equipment.

Machine milking of cows by the vacuum or other process, has now developed until the whole milking operation consists in applying teat cup clusters and starting the equipment; the machine does the rest.

The object of the present invention is still further to mechanise milking.

One feature of the invention comprises machine milking equipment comprising pneumatic apparatus which effects the extraction of milk from a number of animals simultaneously, and automatic control apparatus arranged to control the operation of the milking equipment so that a milking cycle is automatically initiated and carried out under control of said automatic control apparatus.

Another feature of the invention comprises machine milking equipment comprising pneumatic apparatus which effects the extraction of milk from a number of animals simultaneously, milk tubes for conveying extracted milk from individual milking positions to storage apparatus, cleaning liquid storage apparatus, apparatus for circulating cleaning liquid from said liquid storage apparatus through the milk conveyor tube layout, and automatic control apparatus arranged to control the operation of the milking and cleaning equipment so that a complete milking and cleaning cycle is automatically carried out under control of said automatic control apparatus.

In the above consistory clauses and in the claims, the word "cleaning" is to be understood to include the use of any cleaning liquid, including water; "cleansing" is to be

understood to imply the use of some liquid having special cleaning properties over and above those possessed by water; and "washing" is to be understood to imply the use of water or some very weak solution of a cleaning agent or the like.

The practice has now started of keeping cows permanently in their stalls throughout a lactation period, or for periods covering more than one milking, for instance, part or all of a weekend.

It is clear that the use of the equipment set out above lends itself to the automatic initiation of an operational cycle at required times of the day, and a subsidiary feature of the invention comprises the incorporation of timing equipment in the automatic control equipment for initiating a milking cycle a plurality of times in succession at predetermined times of the day.

Such an arrangement would necessitate the attachment of a teat cup cluster to each cow for a period of time including two or more milking times. In order to attain this objective, it is a further feature of the invention to provide a milking harness on the body of each animal supporting the test cup cluster.

When desired the equipment could be detached from the cow or disconnected by a multi-connector provided in the tubes leading from the teat-cup cluster, and fitted to the harness so as to lie on the cows back or elsewhere.

The invention will be described with reference to an embodiment shown in the drawings accompanying the provisional specification in which:—

Fig. 1 shows sufficient of a fully-automatic milking installation to explain the invention.

Fig. 2 shows the individual milking equipment on a cow.

Fig. 3 shows in longitudinal cross-section, a teat cup assembly specially designed for the present purpose, while

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Fig. 4 shows a transverse cross-section of one half of the teat cup assembly of Fig. 3.

The installation shown in Fig. 1 is for one milking stall only, but it is to be understood that the invention can be applied to milking layouts of any size and arrangement.

The equipment is arranged to operate automatically under time control to carry out the following operations in turn: milk, wash, cleanse; and the timing control TE can be arranged to initiate the complete process at regular times morning and evening, so that milking will take place completely automatically time after time without the need for human intervention, under control of the automatic controller RC which has control connections to the various devices.

The number and order of the washing and cleansing operations can be altered at will.

Because the milking harness will be on the cow for long periods it must be carefully designed not to interfere with normal movement, to be perfectly comfortable both when the udder is empty and when it is full, and to allow of ventilation of the udder.

It will probably be necessary, and will, in any case, be desirable, to have an udder harness tailor-made for each particular cow to allow for variations in udder shapes and sizes.

Referring now to Fig. 1, the installation comprises the usual vacuum line VL connected to the vacuum pump VP and provided with the usual vacuum trap VT.

The vacuum line VL is connected to the milk reception tank MRT, which can thereby be under vacuum by pipe MP provided with a cock MC. The vacuum line VL is also connected via cocks such as IVC, pulsator relays such as PR, and tubes such as IVT, to the teat cup clusters TC at each individual stall.

The teat cup clusters are also connected in known manner via milk tubes IMT and milk cocks IMC to milk line ML and to milk reception tank MRT via cock MTC.

A cleaning line CL may be connected at one end by a cock CLC either to a gravity-feed water tank WT or a cleansing solution tank CST. The cleaning line CL can be connected by individual cleaning cocks such as IOC via tubes such as ICT to the individual teat cups.

The tank CST is in two parts, completely separated by a partition PN. The left hand part is completely enclosed except for vacuum pipe PRP and for an outlet to a further cock OC which has connections to the cock MTC and to a waste line WL. The right hand part of CST is open to the atmosphere and has a pipe OLP leading from near the bottom of the tank to control cock CLC. Both parts contain cleansing liquid and the two parts are interconnected via a pump TP arranged to pump liquid from left to right.

The timing equipment TE automatically

initiates a complete cycle of operations twice a day at times which can be adjusted as desired. The cycle of operations is sequentially controlled by the controller RC.

On the initiation of the cycle, the vacuum pump VP will be started, following which the cocks MC, IVC and IMC will be automatically opened, and the milk line ML automatically connected to tank MRT by cock MTC. Valve MC will connect vacuum to tank MRT to assist the flow of milk from the milk line.

The operation of the pulsators PR under control of the vacuum pump will actuate the teat cups to control the flow of milk from the cows to the tank. After a predetermined time, automatically controlled by the timing equipment TE, the cocks IVC, MC, MTC will be shut. The time allowed for milking can be adjusted at the timing equipment; alternatively, or additionally, the time for milking each cow can be individually adjusted by independent time control of each pair of locks IVC, IMC.

When milking has been automatically terminated, washing will be automatically started by setting cock CLC to connect the water tank WT to the cleaning line CL, by opening the cocks IOC and IMC for each cow, and by setting valves MTC, OC to create a direct connection from the milk line through the two cocks to the waste line WL. Water now flows by gravity from tank WT via CLC: CL; the various pairs of cocks IOC, IMC; tubes ICT, IMT, and the equipment therebetween; ML; MTC, OC; WL, to wash out the equipment. Again, after a predetermined adjustable time, water circulation is automatically stopped, and the circulation of cleansing liquid is automatically commenced in the following manner.

Cock PRC is operated to connect vacuum to the left hand part of tank CST. Cocks OC, MTC are set to connect tank CST to the milk line ML; cocks IMC, IOC are opened (or remain open from the washing operation); cock CLC is set to connect the cleansing line CL to the right hand side of tank CST, and pump TP is started. Cleansing solution will now circulate round the circuit: right hand part of tank CST, pipe OLP, CLC, CL, IOC, IMC, MTC, OC, left hand side of CST pump TP. Circulation will continue for a predetermined adjustable time, after which it is automatically terminated, and the cycle completed.

It would be possible, for instance, to repeat the washing after using the cleansing liquid, and if desired to cleanse and wash more than once.

The cycle can be automatically repeated twice a day without human intervention, unless some adjustment is to be made.

The equipment will be automatically monitored and an automatic alarm given at some

convenient place if a fault develops in the equipment.

If desired, a bell or other signal can be automatically given in the parlour before, and also, if desired after the termination of each milking and cleaning cycle.

Milking is by normal vacuum process at any desired pulsator speed and ratio. The pulse action is effected by either standard or magnetic type pulsator and this can be used to govern the milking time for each cow, each stall tap IVC and milk cock IMC being closed after a preset number of pulse beats.

The teat cup cluster remains on the cows held in place by an udder harness made of any light pliable material, the main supporting straps extending over the cows back.

The teat cup shells should be very short and light in weight because they remain on the cow. To avoid their climbing the teat some resistance to climb would need to be fitted, such as a vacuum seal, or a coiled rubber or plastic sleeve on the teat above the teat cup, or the like. The udder harness should be either laced or perforated to allow air to get to the skin of the udder. Each harness and teat cluster would be tailor-made to fit each cow because of the variety of udder shapes and sizes. It should be sufficiently elastic to allow for the contraction of the udder after milking, yet not too highly sprung to cause pressure on the udder that might restrict the flow of milk.

Fig. 2 shows the udder equipment comprising teat cups TP carried by the udder harness UH held in position by the straps HS. The pulsator tube IVT, the milk tube IMT, and the cleansing tube ICT are each connected to each teat cup, and are carried by the body harness HS.

Each teat cup, Figs. 3 and 4, comprises a shell TCS closed at the top by a flexible membrane FM apertured at TA to receive the teat.

A liner mouth piece ring LMR is hollow, is connected to the cleaning tube ICT, and is internally pierced as indicated at CH, Fig. 4 to create a spray of fluid during cleaning. The shell base TCB is integral with the end of the milk tube IMT. A flexible roughly cylindrical membrane TCL is arranged inside the shell TCS and base TCB and is fixed at the top and bottom so as to form an air tight chamber PC between TCS, TCB; and TCL. The bottom of membrane TCL is so shaped that the lower parts can open and close the end of the passage IMT under control of the pressure in the chamber PC.

The pulsator tube IVT passes through the shell TCS and communicates with the chamber PC which is connected to atmosphere and vacuum alternately by pulsator PR in a time ratio of 1 to 3 so that the teat is alternately embraced by membrane TCL to stop milk flow and connected to vacuum via IMT to create milk flow in well known manner. The

membrane can be arranged in any other manner capable of creating correct pulsator conditions in a short teat-cup.

During milking the milk is drawn from the teat into the lower part of the shell under control of membrane TCL and is drawn off via tube IMT by the vacuum on the milk line.

During both water and cleansing liquid circulation, the liquid enters via tube ICT into the ring LMR, sprays out through the ring of holes CH, Fig. 4, on to the teat and the membrane TCL and passes out by the milk tube IMT to the milk line ML, Fig. 1, thus cleaning the interior of all the udder equipment.

It will be seen that all connections to the teat cups are at the open or top end so that the teat cup clusters will interfere as little as possible with an animal's movements and with sitting down.

Many variations are possible within the scope of the appended claims both in the cycle of operations and in the design of the equipment.

WHAT I CLAIM IS:—

1. Machine milking equipment comprising pneumatic apparatus which effects the extraction of milk from a number of animals simultaneously, and automatic control apparatus arranged to control the operation of the milking equipment so that a milking cycle is automatically initiated and carried out under control of said automatic control apparatus.

2. Milking machine equipment comprising pneumatic apparatus which effects the extraction of milk from a number of animals simultaneously, milk tubes for conveying extracted milk from individual milking positions to storage apparatus, cleaning liquid storage apparatus, apparatus for circulating cleaning liquid from said liquid storage apparatus through the milk tubes, and automatic control apparatus arranged to control the operation of the milking and cleaning equipment so that a complete milking and cleaning cycle is automatically carried out under control of said automatic control apparatus.

3. Machine milking equipment as claimed in Claim 1 or 2 and wherein said automatic control apparatus comprises timing apparatus arranged to initiate a plurality of cycles in succession at predetermined times of the day.

4. Machine milking equipment as claimed in Claim 2 alone or in combination with Claim 3 wherein the circulation path for cleaning liquid includes teat cup clusters at the milking positions.

5. Machine milking equipment as claimed in Claim 2 alone or in combination with Claim 3 or Claim 4 and wherein said cleaning liquid storage apparatus includes both cleansing liquid storage apparatus and washing liquid storage apparatus and wherein said automatic control apparatus is arranged to control a

cycle comprising separate milking, cleansing, and washing operations.

5 6. Machine milking equipment as claimed in any one of the preceding claims comprising a milking harness for attachment to the body of an animal and including teat cup clusters for attachment to the udders.

10 7. Machine milking equipment as claimed in Claim 6 and in which all connections to the teat cups are at the open or top end so that the teat cup clusters will interfere as little as possible with an animal's movements and with sitting down.

15 8. Machine milking equipment as claimed in Claim 7 and wherein the connections to the teats are carried by the body harness.

9. Machine milking equipment as claimed in Claim 6, 7 or 8 and wherein each teat cup is short so as to allow of sitting down in comfort with a teat cup cluster in position. 20

10. Machine milking equipment substantially as described.

11. Machine milking equipment substantially as herein described and as illustrated in the drawings accompanying the provisional specification. 25

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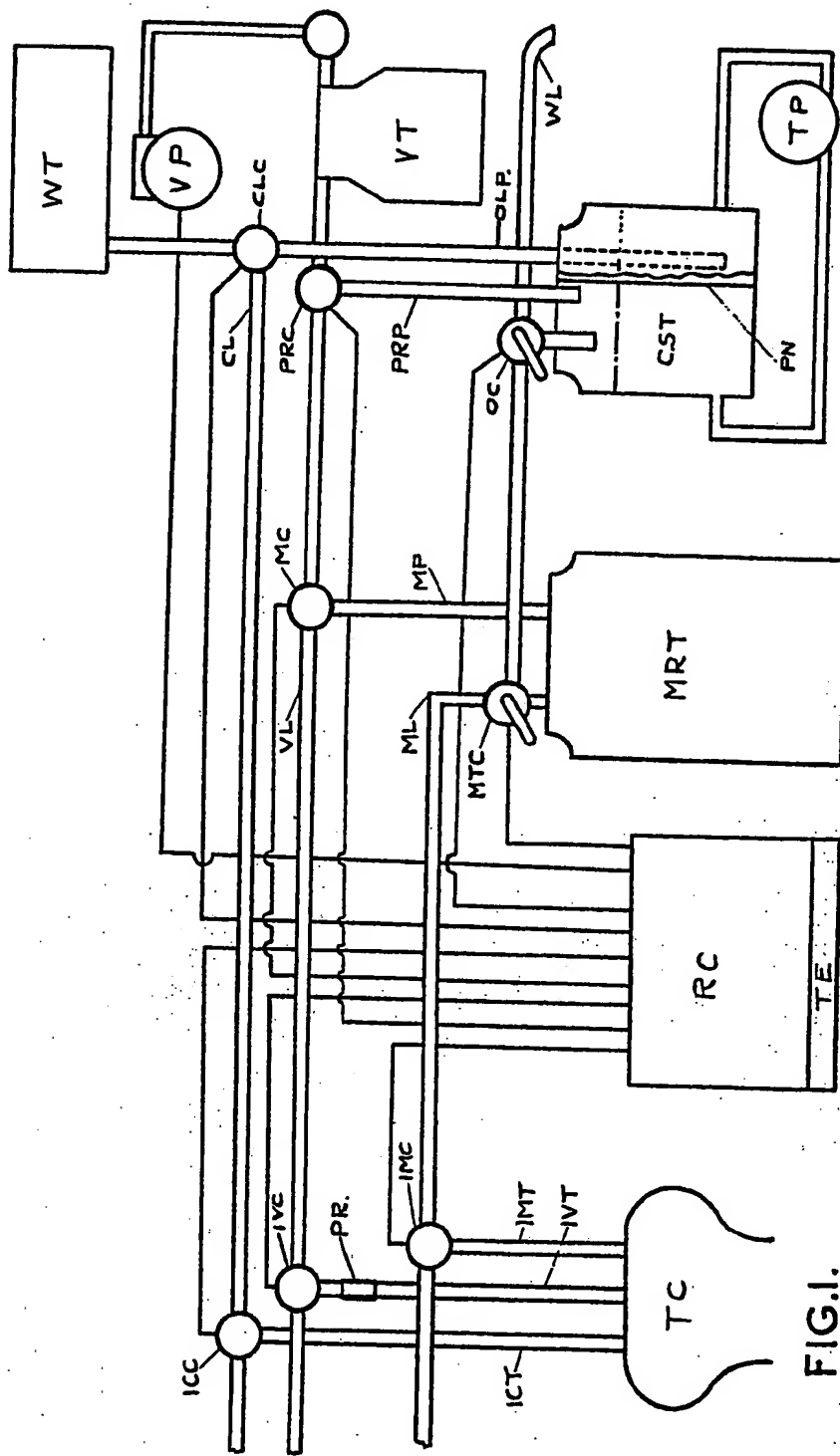


FIG.1.

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2 SHEETS

PROVISIONAL SPECIFICATION

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the Original on a reduced scale.

SHEETS 1 & 2

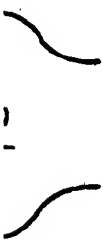
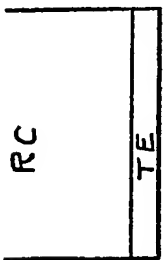
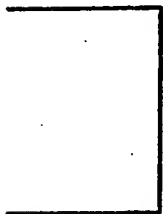
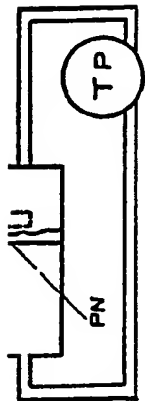


FIG. 1.

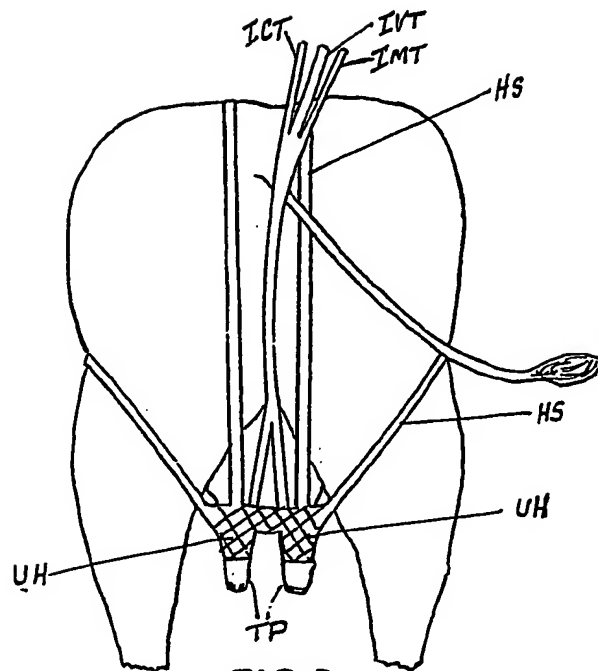


FIG. 2.

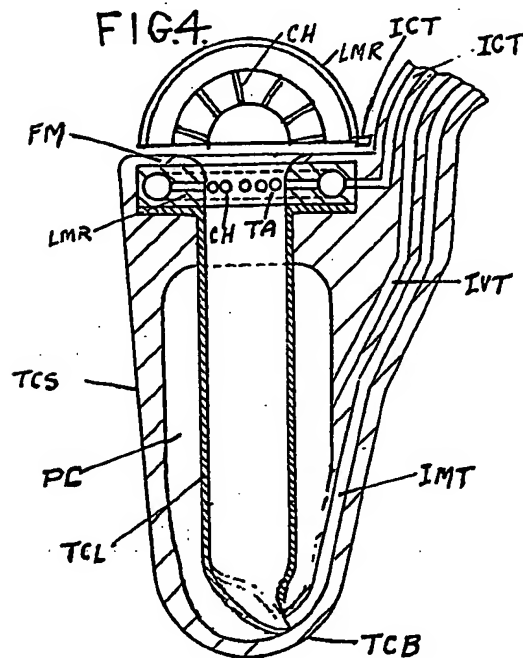


FIG. 3.

FIG. 4.

918,766 PROVISIONAL SPECIFICATION
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the Original on a reduced scale.
SHEETS 1 & 2

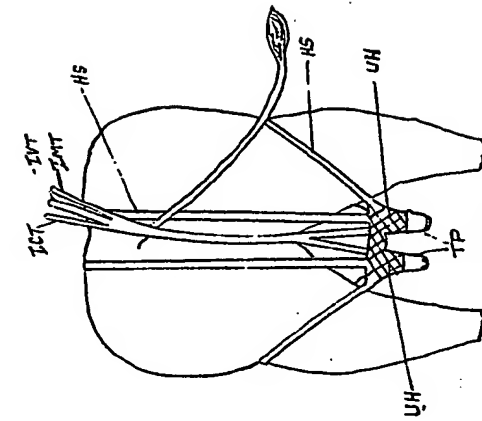


FIG. 2.

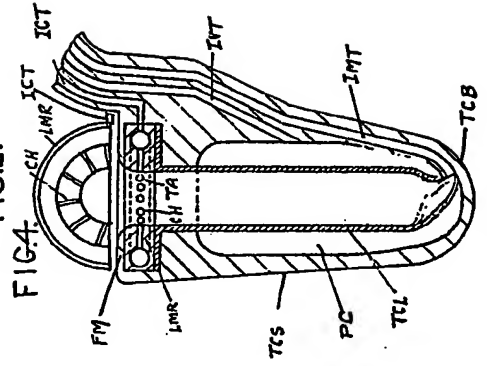


FIG. 3.

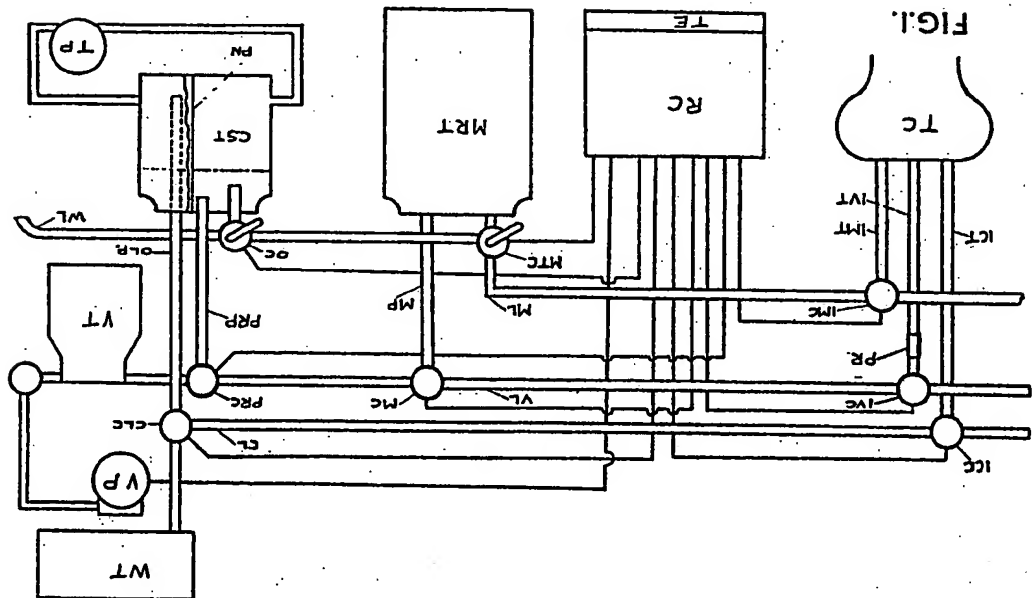


FIG. 1.